Duke Power
A Duke Energy Company

Duke Power
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078-9340
(704) 875-4000

D.M. Jamil
Vice President, McGuire

(704) 875-5333 OFFICE
(704) 875-4809 FAX

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U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station,
Docket No.50-369, 50-370
Unit 1 Cycle 16
Core Operating Limits Report (COLR)

Pursuant to McGuire Technical Specification 5.6.5.d, please find enclosed the McGuire Unit 1 Core Operating Limits Report (COLR). Revision 24 contains limits specific to the McGuire Unit 1 Cycle 16 core.

Questions regarding this submittal should be directed to Kay Crane, McGuire Regulatory Compliance at (704) 875-4306.

D. M. Jamil

Attachment

A001

cc: Mr. R. E. Martin, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Luis Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30323

Mr. Scott Shaeffer
Senior Resident Inspector
McGuire Nuclear Station

bxc: RGC File
ECO50-ELL
P. M. Abraham
Master File

McGuire Unit 1 Cycle 16

Core Operating Limits Report
Revision 24

August 2002

Calculation Number: MCC-1553.05-00-0371

Duke Power Company

		Date
Prepared By:		8/30/2002
Checked By:	(Sections: All)	8.30.2002
Checked By:	(Sections: 2.9 – 2.15)	8/30/2002
Approved By:		8/30/2002

QA Condition 1

The information presented in this report has been prepared and issued in accordance with McGuire Technical Specification 5.6.5.

McGuire 1 Cycle 16 Core Operating Limits Report

IMPLEMENTATION INSTRUCTIONS FOR REVISION 24

Revision 24 to the McGuire Unit 1 COLR contains limits specific to the McGuire Unit 1 Cycle 16 core and may become effective any time after no-mode is reached between Cycles 15 and 16. This revision must become effective prior to entering Mode 6 that starts Cycle 16.

McGuire 1 Cycle 16 Core Operating Limits Report

REVISION LOG

Revision	Effective Date	Effective Pages	COLR
Revisions 0-3	Superseded	N/A	M1C09
Revisions 4-8	Superseded	N/A	M1C10
Revisions 9-11	Superseded	N/A	M1C11
Revisions 12-15	Superseded	N/A	M1C12
Revisions 16-17	Superseded	N/A	M1C13
Revision 18-20	Superseded	N/A	M1C14
Revision 21-23	Superseded	N/A	M1C15
Revision 24	August 30, 2002	1-29	M1C16 (Original Issue)

McGuire 1 Cycle 16 Core Operating Limits Report

INSERTION SHEET FOR REVISION 24

Remove pages	Insert Rev. 24 pages
Pages 1 – 26a	Pages 1 – 29

McGuire 1 Cycle 16 Core Operating Limits Report

1.1 Analytical Methods

The analytical methods used to determine core operating limits for parameters identified in Technical Specifications and previously reviewed and approved by the NRC as specified in Technical Specification 5.6.5 as follows.

1. WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," (W Proprietary).

   Revision 0
   Report Date: July 1985
   Not Used for M1C16

2. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model using the NOTRUMP Code, " (W Proprietary).

   Revision 0
   Report Date: August 1985

3. WCAP-10266-P-A, "THE 1981 VERSION OF WESTINGHOUSE EVALUATION MODEL USING BASH CODE", (W Proprietary).

   Revision 2
   Report Date: March 1987
   Not Used for M1C16

4. WCAP-12945-P-A, Volume 1 and Volumes 2-5, "Code Qualification Document for Best-Estimate Loss of Coolant Analysis," (W Proprietary).

   Revision: Volume 1 (Revision 2) and Volumes 2-5 (Revision 1)
   Report Date: March 1998

5. BAW-10168P-A, "B&W Loss-of-Coolant Accident Evaluation Model for Recirculating Steam Generator Plants," (B&W Proprietary).

   Revision 1
   SER Date: January 22, 1991
   Revision 2
   SER Dates: August 22, 1996 and November 26, 1996.
   Revision 3
   SER Date: June 15, 1994.
   Not Used for M1C16

6. DPC-NE-3000PA, "Thermal-Hydraulic Transient Analysis Methodology," (DPC Proprietary)

   Revision 2
   SER Date. October 14, 1998

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1.1 Analytical Methods (continued)

7. DPC-NE-3001PA, "Multidimensional Reactor Transients and Safety Analysis Physics Parameter Methodology," (DPC Proprietary).

   Revision 0
   Report Date: November 1991

8. DPC-NE-3002A, "FSAR Chapter 15 System Transient Analysis Methodology".

   Revision 4
   SER Date: April 6, 2001

9. DPC-NE-2004P-A, "Duke Power Company McGuire and Catawba Nuclear Stations Core Thermal-Hydraulic Methodology using VIPRE-01," (DPC Proprietary).

   Revision 1
   SER Date: February 20, 1997

10. DPC-NE-2005P-A, "Thermal Hydraulic Statistical Core Design Methodology," (DPC Proprietary).

    Revision 1
    SER Date: November 7, 1996

11. DPC-NE-2008P-A, "Fuel Mechanical Reload Analysis Methodology Using TACO3," (DPC Proprietary)

    Revision 0
    SER Date: April 3, 1995

12. DPC-NE-2009-P-A, "Westinghouse Fuel Transition Report," (DPC Proprietary).

    Revision 0
    SER Date. September 22. 1999

13. DPC-NE-1004A, "Nuclear Design Methodology Using CASMO-3/SIMULATE-3P "

    Revision 1
    SER Date: April 26. 1996

14. DPC-NF-2010A. "Duke Power Company McGuire Nuclear Station Catawba Nuclear Station Nuclear Physics Methodology for Reload Design."

    Revision 0
    Report Date June 1985

McGuire 1 Cycle 16 Core Operating Limits Report

1.1 Analytical Methods (continued)

15. DPC-NE-2011PA, "Duke Power Company Nuclear Design Methodology for Core Operating Limits of Westinghouse Reactors," (DPC Proprietary).

    Revision 0
    Report Date: March 1990

2.0 Operating Limits

The cycle-specific parameter limits for the specifications listed in section 1.0 are presented in the following subsections. These limits have been developed using NRC approved methodologies specified in Section 1.1.

2.1 Requirements for Operational Mode 6

The following condition is required for operational mode 6.

2.1.1 The Reactivity Condition requirement for operational mode 6 is that k_{eff} must be less than, or equal to 0.95.

2.2 Shutdown Margin - SDM (TS 3.1.1, TS 3.1.4, TS 3.1.5, TS 3.1.6 and TS 3.1.8)

2.2.1 For TS 3.1.1, SDM shall be $\geq$ 1.3% ΔK/K in mode 2 with k-eff < 1.0 and in modes 3 and 4.

2.2.2 For TS 3.1.1, SDM shall be $\geq$ 1.0% ΔK/K in mode 5.

2.2.3 For TS 3.1.4, SDM shall be $\geq$ 1.3% ΔK/K in modes 1 and 2.

2.2.4 For TS 3.1.5, SDM shall be $\geq$ 1.3% ΔK/K in mode 1 and mode 2 with any control bank not fully inserted.

2.2.5 For TS 3.1.6, SDM shall be $\geq$ 1.3% ΔK/K in mode 1 and mode 2 with K-eff $\geq$ 1.0.

2.2.6 For TS 3.1.8, SDM shall be $\geq$ 1.3% ΔK/K in mode 2 during physics testing.

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2.3 Moderator Temperature Coefficient - MTC (TS 3.1.3)

2.3.1 The Moderator Temperature Coefficient (MTC) Limits are:

The MTC shall be less positive than the upper limits shown in Figure 1. The BOC, ARO, HZP MTC shall be less positive than 0.7E-04 $\Delta K/K/°F$.

The EOC, ARO, RTP MTC shall be less negative than the -4.1E-04 $\Delta K/K/°F$ lower MTC limit.

2.3.2 The 300 PPM MTC Surveillance Limit is:

The measured 300 PPM ARO, equilibrium RTP MTC shall be less negative than or equal to -3.2E-04 $\Delta K/K/°F$.

2.3.3 The 60 PPM MTC Surveillance Limit is:

The 60 PPM ARO, equilibrium RTP MTC shall be less negative than or equal to -3.85E-04 $\Delta K/K/°F$.

Where,

BOC = Beginning of Cycle (Burnup corresponding to the most positive MTC.)
EOC = End of Cycle
ARO = All Rods Out
HZP = Hot Zero Power
RTP = Rated Thermal Power
PPM = Parts per million (Boron)

2.4 Shutdown Bank Insertion Limit (TS 3.1.5)

2.4.1 Each shutdown bank shall be withdrawn to at least 226 steps. Shutdown banks are withdrawn in sequence and with no overlap.

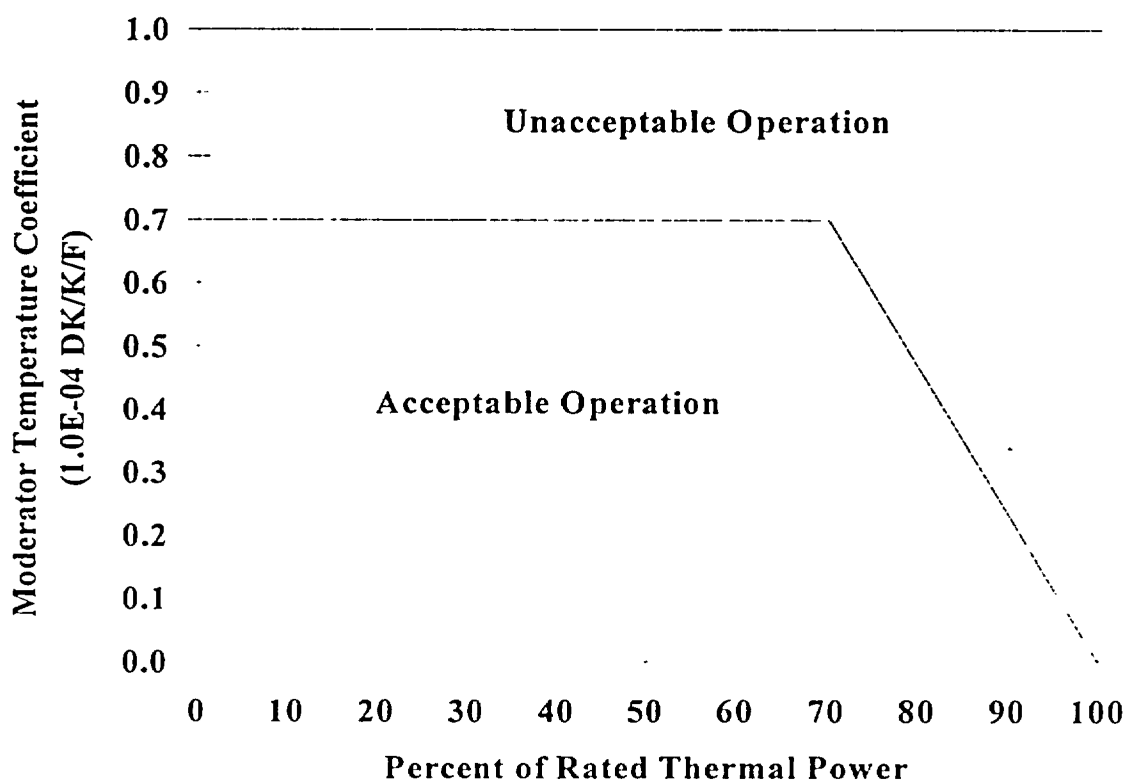
2.5 Control Bank Insertion Limits (TS 3.1.6)

2.5.1 Control banks shall be within the insertion, sequence, and overlap limits shown in Figure 2. Specific control bank withdrawal and overlap limits as a function of the fully withdrawn position are shown in Table 1.

McGuire 1 Cycle 16 Core Operating Limits Report

Figure 1

Moderator Temperature Coefficient Upper Limit Versus Power Level



NOTE: Compliance with Technical Specification 3.1.3 may require rod withdrawal limits. Refer to OP/1/A/6100/22 Unit 1 Data Book for details.

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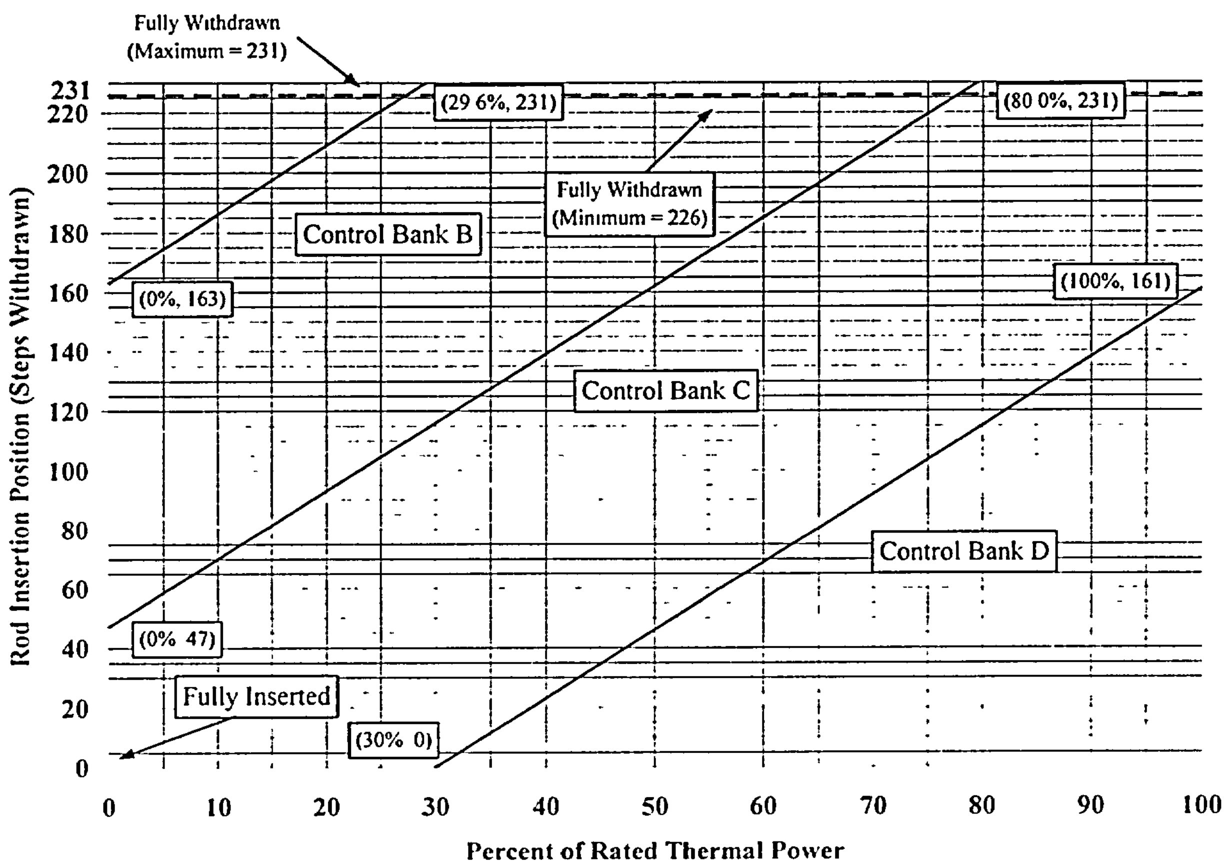
Figure 2

Control Bank Insertion Limits Versus Percent Rated Thermal Power



NOTE: Compliance with Technical Specification 3.1.3 may require rod withdrawal limits. Refer to OP/1/A/6100/22 Unit 1 Data Book for details.

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Table 1
RCCA Withdrawal Steps and Sequence

RCCAs Fully Withdrawn at 226 SWD

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
226 Stop	110	0	0
226	116	0 Start	0
226	226 Stop	110	0
226	226	116	0 Start
226	226	226 Stop	110

RCCAs Fully Withdrawn at 227 SWD

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
227 Stop	111	0	0
227	116	0 Start	0
227	227 Stop	111	0
227	227	116	0 Start
227	227	227 Stop	111

RCCAs Fully Withdrawn at 228 SWD

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
228 Stop	112	0	0
228	116	0 Start	0
228	228 Stop	112	0
228	228	116	0 Start
228	228	228 Stop	112

RCCAs Fully Withdrawn at 229 SWD

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
229 Stop	113	0	0
229	116	0 Start	0
229	229 Stop	113	0
229	229	116	0 Start
229	229	229 Stop	113

RCCAs Fully Withdrawn at 230 SWD

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
230 Stop	114	0	0
230	116	0 Start	0
230	230 Stop	114	0
230	230	116	0 Start
230	230	230 Stop	114

RCCAs Fully Withdrawn at 231 SWD

Control Bank A	Control Bank B	Control Bank C	Control Bank D
0 Start	0	0	0
116	0 Start	0	0
231 Stop	115	0	0
231	116	0 Start	0
231	231 Stop	115	0
231	231	116	0 Start
231	231	231 Stop	115

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2.6 Heat'Flux Hot Channel Factor - $F_Q(X,Y,Z)$ (TS 3.2.1)

2.6.1 $F_Q(X,Y,Z)$ steady-state limits are defined by the following relationships:

$$F_Q^{RTP} * K(Z)/P \qquad \text{for } P > 0.5$$
$$F_Q^{RTP} * K(Z)/0.5 \qquad \text{for } P \leq 0.5$$

where,

P = (Thermal Power)/(Rated Power)

Note: The measured $F_Q(X,Y,Z)$ shall be increased by 3% to account for manufacturing tolerances and 5% to account for measurement uncertainty when comparing against the LCO limits. The manufacturing tolerance and measurement uncertainty are implicitly included in the F_Q surveillance limits as defined in COLR Sections 2.6.5 and 2.6.6.

2.6.2 $F_Q^{RTP} = 2.50 \times K(BU)$

2.6.3 K(Z) is the normalized $F_Q(X,Y,Z)$ as a function of core height. The K(Z) function for MkBW and Westinghouse RFA fuel is provided in Figure 3.

2.6.4 K(BU) is the normalized $F_Q(X,Y,Z)$ as a function of burnup. K(BU) for both MkBW and Wesinghouse RFA fuel is 1.0 for all burnups.

The following parameters are required for core monitoring per the Surveillance Requirements of Technical Specification 3.2.1:

2.6.5 $$[F_Q^L(X,Y,Z)]^{OP} = \frac{F_Q^D(X,Y,Z) * M_Q(X,Y,Z)}{UMT * MT * TILT}$$

where:

$[F_Q^L(X,Y,Z)]^{OP}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_Q(X,Y,Z)$ LOCA limit will be preserved for operation within the LCO limits. $[F_Q^L(X,Y,Z)]^{OP}$ includes allowances for calculation and measurement uncertainties

$F_Q^D(X,Y,Z)$ = Design power distribution for F_Q. $F_Q^D(X,Y,Z)$ is provided in Table 4, Appendix A, for normal operating conditions and in

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Table 5, Appendix A for power escalation testing during initial startup operation.

$M_Q(X,Y,Z)$ = Margin remaining in core location X,Y,Z to the LOCA limit in the transient power distribution. $M_Q(X,Y,Z)$ is provided in Table 4, Appendix A for normal operating conditions and in Table 5, Appendix A for power escalation testing during initial startup operation.

UMT = Total Peak Measurement Uncertainty. (UMT = 1.05)

MT = Engineering Hot Channel Factor. (MT = 1.03)

TILT = Peaking penalty that accounts for the peaking increase from an allowable quadrant power tilt ratio of 1.02. (TILT = 1.035)

Note: $[F_Q^L(X,Y,Z)]^{OP}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA.

2.6.6 $$[F_Q^L(X,Y,Z)]^{RPS} = \frac{F_Q^D(X,Y,Z) * M_C(X,Y,Z)}{UMT * MT * TILT}$$

where:

$[F_Q^L(X,Y,Z)]^{RPS}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_Q(X,Y,Z)$ Centerline Fuel Melt (CFM) limit will be preserved for operation within the LCO limits. $[F_Q^L(X,Y,Z)]^{RPS}$ includes allowances for calculation and measurement uncertainties.

$F_Q^D(X,Y,Z)$ = Design power distributions for F_Q $F_Q^D(X,Y,Z)$ is provided in Table 4, Appendix A for normal operating conditions and in Table 5, Appendix A for power escalation testing during initial startup operation.

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$M_C(X,Y,Z)$ = Margin remaining to the CFM limit in core location X,Y,Z from the transient power distribution. $M_C(X,Y,Z)$ calculations parallel the $M_Q(X,Y,Z)$ calculations described in DPC-NE-2011PA, except that the LOCA limit is replaced with the CFM limit. $M_C(X,Y,Z)$ is provided in Table 6, Appendix A for normal operating conditions and in Table 7, Appendix A for power escalation testing during initial startup operation.

UMT = Total Peak Measurement Uncertainty (UMT = 1.05)

MT = Engineering Hot Channel Factor (MT = 1.03)

TILT = Peaking penalty that accounts for the peaking increase for an allowable quadrant power tilt ratio of 1.02. (TILT = 1.035)

Note: $[F_Q^L(X,Y,Z)]^{RPS}$ is the parameter identified as $F_Q^{MAX}(X,Y,Z)$ in DPC-NE-2011PA, except that $M_Q(X,Y,Z)$ is replaced by $M_C(X,Y,Z)$.

2.6.7 KSLOPE = 0.0725

where:

KSLOPE is the adjustment to the K_1 value from OTΔT trip setpoint required to compensate for each 1% that $F_Q^M(X,Y,Z)$ exceeds $[F_Q^L(X,Y,Z)]^{RPS}$.

2.6.8 $F_Q(X,Y,Z)$ penalty factors for Technical Specification Surveillance's 3.2.1.2 and 3.2.1.3 are provided in Table 2.

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Figure 3

K(Z), Normalized $F_Q(X,Y,Z)$ as a Function of Core Height for MkBW and Westinghouse RFA Fuel

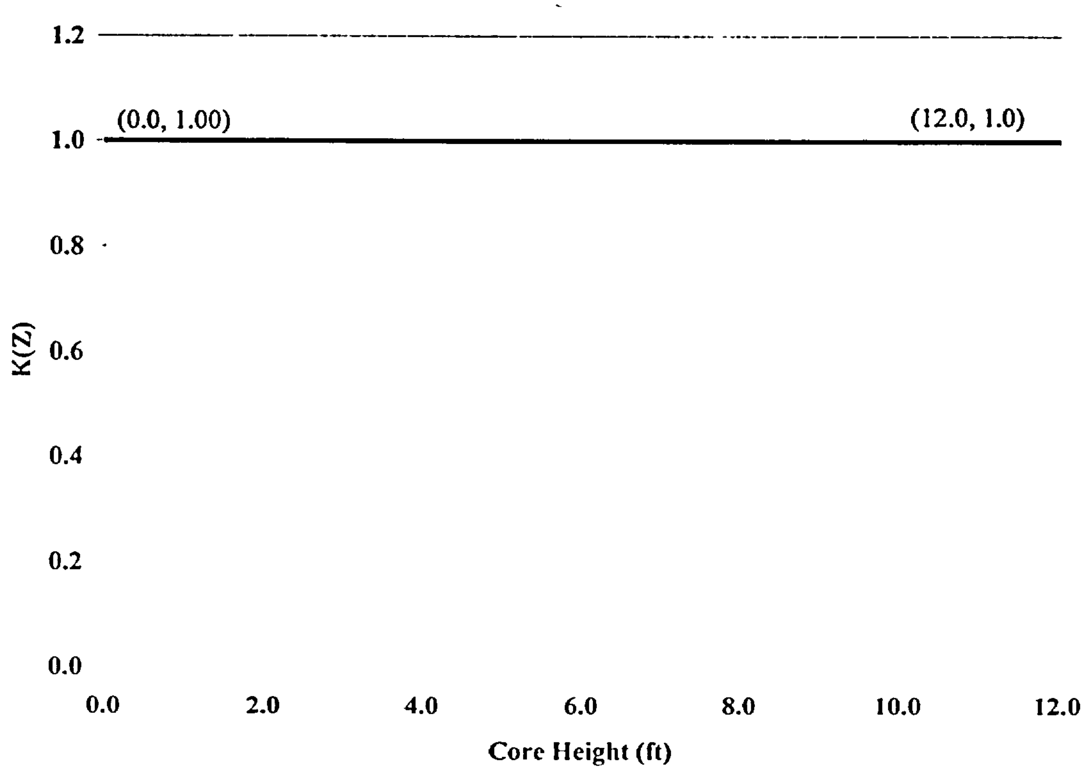

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Table 2
$F_Q(X,Y,Z)$ and $F_{\Delta H}(X,Y)$ Penalty Factors
For Technical Specification Surveillance's 3.2.1.2, 3.2.1.3 and 3.2.2.2

Burnup (EFPD)	$F_Q(X,Y,Z)$ Penalty Factor (%)	$F_{\Delta H}(X,Y,Z)$ Penalty Factor (%)
0	2.00	2.00
4	2.00	2.00
12	2.00	2.00
25	2.00	2.00
50	2.00	2.00
75	2.00	2.00
100	2.00	2.00
125	2.00	2.00
150	2.00	2.00
175	2.00	2.03
200	2.00	2.00
225	2.00	2.00
250	2.00	2.00
275	2.00	2.00
300	2.00	2.00
325	2.00	2.00
350	2.00	2.00
375	2.00	2.00
520	2.00	2.00

Note:	Linear interpolation is adequate for intermediate cycle burnups. All cycle burnups outside of the range of the table shall use a 2% penalty factor for both $F_Q(X,Y,Z)$ and $F_{\Delta H}(X,Y)$ for compliance with the Technical Specification Surveillances 3.2.1.2, 3.2.1.3 and 3.2.2.2.

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2.7 Nuclear Enthalpy Rise Hot Channel Factor - $F_{\Delta H}(X,Y)$ (TS 3.2.2)

The $F_{\Delta H}$ steady-state limits referred to in Technical Specification 3.2.2 is defined by the following relationship.

2.7.1 $$[F^{L}_{\Delta H}(X,Y)]^{LCO} = \text{MARP}(X,Y) * \left[1.0 + \frac{1}{\text{RRH}} * (1.0 - P)\right]$$

where:

$[F^{L}_{\Delta H}(X,Y)]^{LCO}$ is defined as the steady-state, maximum allowed radial peak. $[F^{L}_{\Delta H}(X,Y)]^{LCO}$ includes allowances for calculation-measurement uncertainty.

MARP(X,Y) = Cycle-specific operating limit Maximum Allowable Radial Peaks. MARP(X,Y) radial peaking limits are provided in Table 3.

$$P = \frac{\text{Thermal Power}}{\text{Rated Thermal Power}}$$

RRH = Thermal Power reduction required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}(X,Y)$, exceeds the limit. RRH also is used to scale the MARP limits as a function of power per the $[F^{L}_{\Delta H}(X,Y)]^{LCO}$ equation. (RRH = 3.34 $(0.0 < P \leq 1.0)$)

The following parameters are required for core monitoring per the Surveillance requirements of Technical Specification 3.2.2.

2.7.2 $$[F^{L}_{\Delta H}(X,Y)]^{SURV} = \frac{F^{D}_{\Delta H}(X,Y) \times M_{\Delta H}(X,Y)}{\text{UMR} \times \text{TILT}}$$

where:

$[F^{L}_{\Delta H}(X,Y)]^{SURV}$ = Cycle dependent maximum allowable design peaking factor that ensures that the $F_{\Delta H}(X,Y)$ limit will be preserved for operation within the LCO limits. $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ includes allowances for calculation-measurement uncertainty.

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$F^{D}_{\Delta H}(X,Y)$ = Design radial power distribution for $F_{\Delta H}$. $F^{D}_{\Delta H}(X,Y)$ is provided in Table 8, Appendix A for normal operation and in Table 9, Appendix A for power escalation testing during initial startup operation.

$M_{\Delta H}(X,Y)$ = The margin remaining in core location X,Y relative to the Operational DNB limits in the transient power distribution. $M_{\Delta H}(X,Y)$ is provided in Table 8, Appendix A for normal operation and in Table 9, Appendix A for power escalation testing during initial startup operation.

UMR = Uncertainty value for measured radial peaks. UMR is set to 1.0 since a factor of 1.04 is implicitly included in the variable $M_{\Delta H}(X,Y)$.

TILT = Peaking penalty that accounts for the peaking increase for an allowable quadrant power tilt ratio of 1.02, (TILT = 1.035).

NOTE: $[F^{L}_{\Delta H}(X,Y)]^{SURV}$ is the parameter identified as $F_{\Delta H}(X,Y)^{MAX}$ in DPC-NE-2011PA.

2.7.3 RRH = 3.34

where:

RRH = Thermal power reduction required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}(X,Y)$ exceeds its limit. $(0 < P \leq 1.0)$

2.7.4 TRH = 0.04

where:

TRH = Reduction in OTΔT K_1 setpoint required to compensate for each 1% that the measured radial peak, $F^{M}_{\Delta H}(X,Y)$ exceeds its limit.

2.7.5 $F_{\Delta H}(X,Y)$ penalty factors for Technical Specification Surveillance 3.2.2.2 are provided in Table 2.

2.8 Axial Flux Difference – AFD (TS 3.2.3)

2.8.1 The Axial Flux Difference (AFD) Limits are provided in Figure 4.

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Table 3
Maximum Allowable Radial Peaks (MARPs)
(Applicable to Both MkBW and RFA Fuel)

Core Ht. (ft)	Axial Peak -----> 1.05	1.10	1.20	1.30	1.40	1.50	1.60
0.12	1.687	1.716	1.782	1.838	1.888	1.933	1.863
1.20	1.684	1.715	1.776	1.830	1.878	1.896	1.839
2.40	1.683	1.711	1.767	1.819	1.858	1.845	1.789
3.60	1.681	1.707	1.758	1.802	1.810	1.795	1.742
4.80	1.678	1.701	1.747	1.785	1.759	1.744	1.692
6.00	1.674	1.695	1.733	1.748	1.703	1.692	1.643
7.20	1.669	1.687	1.716	1.696	1.649	1.633	1.587
8.40	1.664	1.675	1.685	1.643	1.595	1.579	1.534
9.60	1.656	1.660	1.635	1.585	1.543	1.529	1.487
10.80	1.645	1.633	1.587	1.535	1.488	1.476	1.434
12.00	1.620	1.592	1.538	1.490	1.442	1.432	1.394

Core Ht. (ft)	Axial Peak -----> 1.70	1.80	1.90	2.10	3.00	3.25
0.12	1.807	1.723	1.645	1.543	1.218	1.153
1.20	1.815	1.740	1.664	1.548	1.188	1.123
2.40	1.772	1.715	1.659	1.561	1.170	1.108
3.60	1.721	1.667	1.617	1.555	1.213	1.141
4.80	1.674	1.624	1.574	1.510	1.227	1.182
6.00	1.627	1.579	1.533	1.465	1.197	1.148
7.20	1.571	1.527	1.488	1.424	1.165	1.116
8.40	1.522	1.479	1.440	1.373	1.134	1.089
9.60	1.476	1.436	1.399	1.337	1.110	1.065
10.80	1.427	1.390	1.355	1.294	1.075	1.033
12.00	1.389	1.356	1.327	1.273	1.061	1.017

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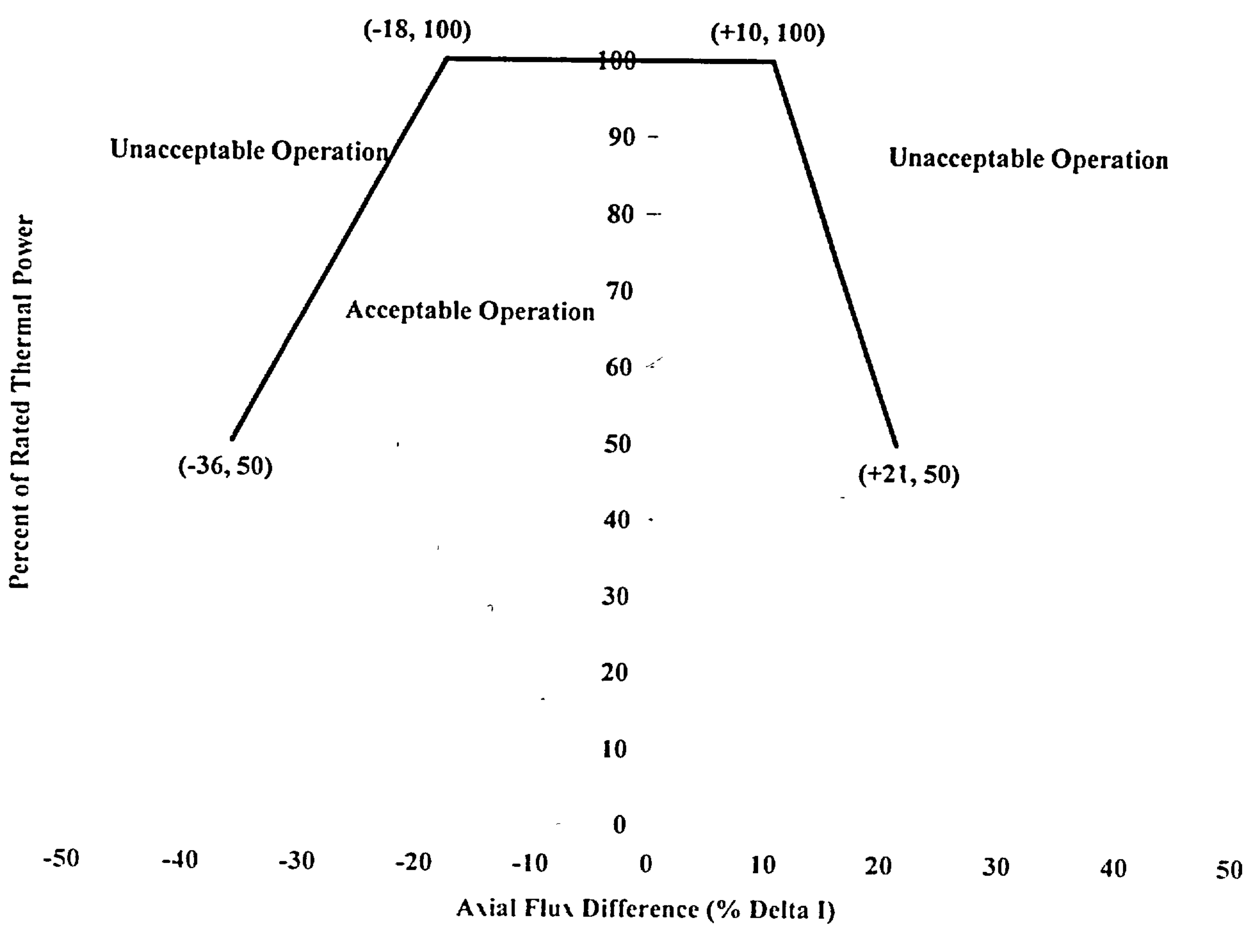
Figure 4

Percent of Rated Thermal Power Versus Percent Axial Flux Difference Limits



NOTE: Compliance with Technical Specification 3.2.1 may require more restrictive AFD limits Refer to OP/1/A/6100/22 Unit 1 Data Book of more details.

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2.9 Reactor Trip System Instrumentation Setpoints (TS 3.3.1) Table 3.3.1-1

2.9.1 Overtemperature ΔT Setpoint Parameter Values

Parameter	Value
Overtemperature ΔT reactor trip setpoint	$K_1 \leq 1.1978$
Overtemperature ΔT reactor trip heatup setpoint penalty coefficient	$K_2 = 0.0334/^oF$
Overtemperature ΔT reactor trip depressurization setpoint penalty coefficient	$K_3 = 0.001601/psi$
Time constants utilized in the lead-lag compensator for ΔT	$\tau_1 \geq 8$ sec. $\tau_2 \leq 3$ sec.
Time constant utilized in the lag compensator for ΔT	$\tau_3 \leq 2$ sec.
Time constants utilized in the lead-lag compensator for T_{avg}	$\tau_4 \geq 28$ sec. $\tau_5 \leq 4$ sec.
Time constant utilized in the measured T_{avg} lag compensator	$\tau_6 \leq 2$ sec.
$f_1(\Delta I)$ "positive" breakpoint	= 19.0 %ΔI
$f_1(\Delta I)$ "negative" breakpoint	= N/A*
$f_1(\Delta I)$ "positive" slope	= 1.769 $\%\Delta T_0 / \%\Delta I$
$f_1(\Delta I)$ "negative" slope	= N/A*

* The $f_1(\Delta I)$ "negative" breakpoint and the $f_1(\Delta I)$ "negative" slope are not applicable since the $f_1(\Delta I)$ function is not required below the $f_1(\Delta I)$ "positive" breakpoint of 19.0% ΔI.

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2.9.2 Overpower ΔT Setpoint Parameter Values

Parameter	Value
Overpower ΔT reactor trip setpoint	$K_4 \leq 1.0864$
Overpower ΔT reactor trip heatup setpoint penalty coefficient	$K_6 = 0.001179/^{o}F$
Time constants utilized in the lead-lag compensator for ΔT	$\tau_1 \geq 8$ sec. $\tau_2 \leq 3$ sec.
Time constant utilized in the lag compensator for ΔT	$\tau_3 \leq 2$ sec.
Time constant utilized in the measured T_{avg} lag compensator	$\tau_6 \leq 2$ sec.
Time constant utilized in the rate-lag controller for T_{avg}	$\tau_7 \geq 5$ sec.
$f_2(\Delta I)$ "positive" breakpoint	= 35.0 %ΔI
$f_2(\Delta I)$ "negative" breakpoint	= -35.0 %ΔI
$f_2(\Delta I)$ "positive" slope	= 7.0 $\%\Delta T_0/\ \%\Delta I$
$f_2(\Delta I)$ "negative" slope	= 7.0 $\%\Delta T_0/\ \%\Delta I$

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2.10 Accumulators (TS 3.5.1)

2.10.1 Boron concentration limits during modes 1 and 2, and mode 3 with RCS pressure >1000 psi:

Parameter	Limit
Cold Leg Accumulator minimum boron concentration.	2,475 ppm
Cold Leg Accumulator maximum boron concentration.	2,875 ppm

2.11 Refueling Water Storage Tank - RWST (TS 3.5.4)

2.11.1 Boron concentration limits during modes 1, 2, 3, and 4:

Parameter	Limit
Refueling Water Storage Tank minimum boron concentration.	2,675 ppm
Refueling Water Storage Tank maximum boron concentration.	2,875 ppm

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2.12 Spent Fuel Pool Boron Concentration (TS 3.7.14)

2.12.1 Minimum boron concentration limit for the spent fuel pool. Applicable when fuel assemblies are stored in the spent fuel pool.

Parameter	Limit
Spent fuel pool minimum boron concentration.	2,675 ppm

2.13 Refueling Operations - Boron Concentration (TS 3.9.1)

2.13.1 Minimum boron concentration limit for the filled portions of the Reactor Coolant System, refueling canal, and refueling cavity for mode 6 conditions. The minimum boron concentration limit and plant refueling procedures ensure that the Keff of the core will remain within the mode 6 reactivity requirement of Keff $\leq$ 0.95.

Parameter	Limit
Minimum Boron concentration of the Reactor Coolant System, the refueling canal, and the refueling cavity.	2,675 ppm

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2.14 Borated Water Source – Shutdown (SLC 16.9.14)

2.14.1 Volume and boron concentrations for the Boric Acid Tank (BAT) and the Refueling Water Storage Tank (RWST) during mode 4 with any RCS cold leg temperature ≤ 300 °F and modes 5 and 6.

Parameter	Limit
Boric Acid Tank minimum contained borated water volume	10,599 gallons 13.6% Level

> Note: When cycle burnup is > 455 EFPD, Figure 6 may be used to determine the required BAT minimum level.

Parameter	Limit
Boric Acid Tank minimum boron concentration	7,000 ppm
Boric Acid Tank minimum water volume required to maintain SDM at 7,000 ppm	2,300 gallons
Refueling Water Storage Tank minimum contained borated water volume	47,700 gallons 41 inches
Refueling Water Storage Tank minimum boron concentration	2,675 ppm
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,675 ppm	8,200 gallons

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2.15 Borated Water Source - Operating (SLC 16.9.11)

2.15.1 Volume and boron concentrations for the Boric Acid Tank (BAT) and the Refueling Water Storage Tank (RWST) during modes 1, 2, 3, and mode 4 with all RCS cold leg temperatures > 300°F.

Parameter	Limit
Boric Acid Tank minimum contained borated water volume	22,049 gallons 38.0% Level

> Note: When cycle burnup is > 455 EFPD, Figure 6 may be used to determine the required BAT minimum level.

Parameter	Limit
Boric Acid Tank minimum boron concentration	7,000 ppm
Boric Acid Tank minimum water volume required to maintain SDM at 7,000 ppm	13,750 gallons
Refueling Water Storage Tank minimum contained borated water volume	96,607 gallons 103.6 inches
Refueling Water Storage Tank minimum boron concentration	2,675 ppm
Refueling Water Storage Tank maximum boron concentration (TS 3.5.4)	2875 ppm
Refueling Water Storage Tank minimum water volume required to maintain SDM at 2,675 ppm	57,107 gallons

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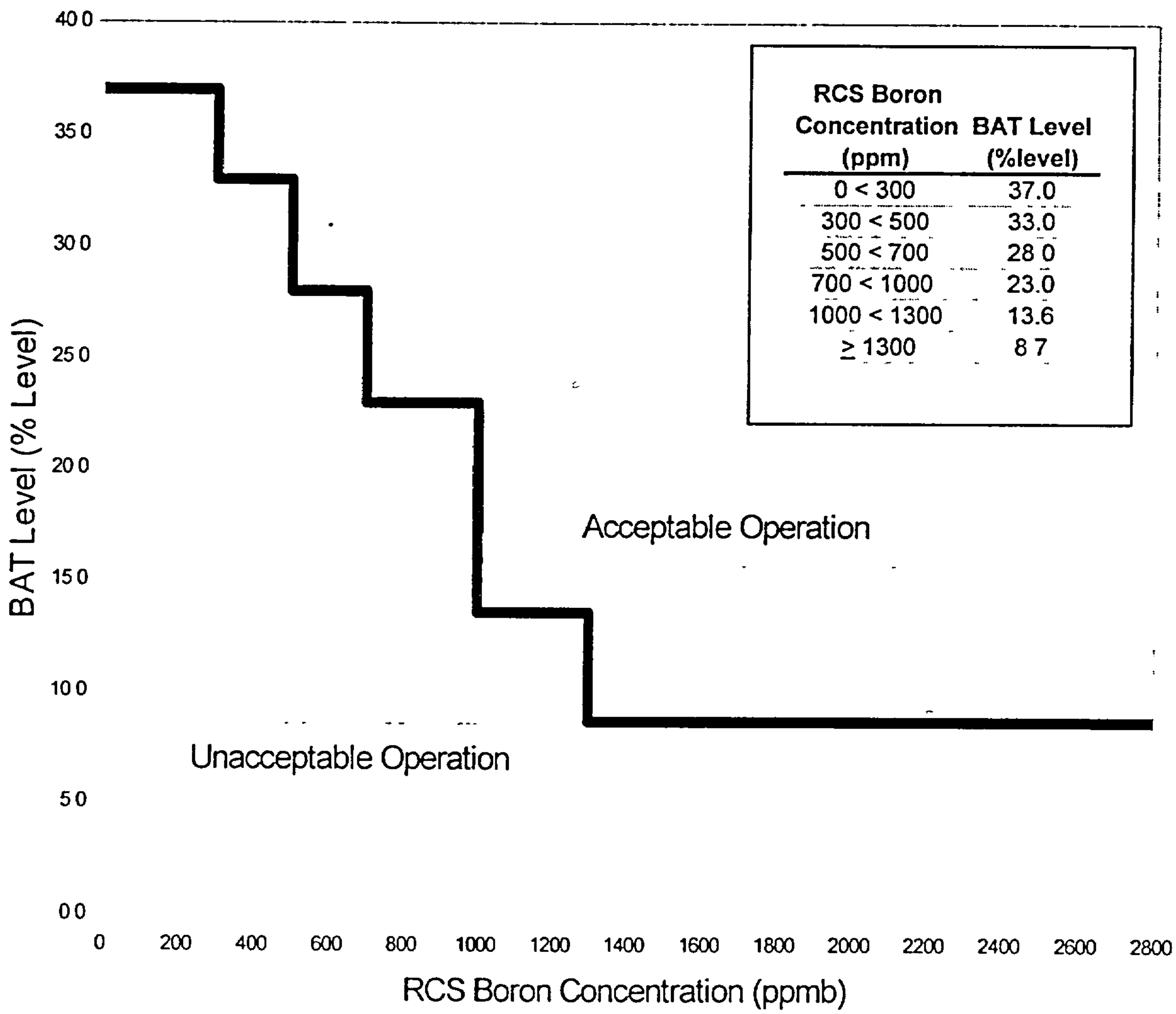
Figure 6

Boric Acid Storage Tank Indicated Level Versus RCS Boron Concentration

(Valid When Cycle Burnup is > 455 EFPD)

This figure includes additional volumes listed in SLC 16.9.14 and 16.9.11



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NOTE: Data contained in the Appendix to this document was generated in the McGuire 1 Cycle 16 Maneuvering Analysis calculation file, MCC-1553.05-00-0353. The Plant Nuclear Engineering Section will control this information via computer file(s) and should be contacted if there is a need to access this information.